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Parabolic Trough Solar Technology

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Glossary

Aperture width

> Straight distance between mirror edges across the PTC

Absorber tube

> Dark tube positioned in the focal line, typically from steel with coating and with evacuated glass envelope to minimize heat loss, converting solar radiation energy into thermal energy in the fluid, see receiver

Collector loop (PTC)

> Unit of several PTC connected in series to heat the fluid from inlet to outlet header temperature

Direct normal irradiance, beam irradiance

> Direct part of the sunlight, coming from within the sun disk as almost parallel light onto a surface, measured as power density in kW/m^2

Drive (PTC)

> Unit consisting of motor and gear or hydraulic drive with valves and cylinders, and the controller to turn the PTC into the correct operational tracking angle

Efficiency

Ratio of useful energy and total energy input

Efficiency (PTC)

Ratio of thermal energy output from the PTC and total solar radiation received on the aperture area

Heat transfer fluid (“HTF”)

Fluid receiving the...

Bibliography

Primary Literature

1. Epp B (2019) www.solar-payback.com (http://www.solar-payback.com), www.solarthermalworld.org (http://www.solarthermalworld.org) (solar heat in industrial processes, suppliers, applications)
2. Fernández-García A, Sutter F, et al. (2018) Parameters and method to evaluate the reflectance properties of reflector materials for concentrating solar power technology 3.0. SolarPaces Guideline. http://www.solarpaces.org/csp-research-tasks/task-annexes-iea/task-iii-solar-technology-and-advanced-applications/reflectance-measurement-guidelines/ (http://www.solarpaces.org/csp-research-tasks/task-annexes-iea/task-iii-solar-technology-and-advanced-applications/reflectance-measurement-guidelines/)
3. Fredriksson JR (2019) Concentrating solar power: a comparison and evaluation of innovative parabolic trough collector concepts for large scale application – Annex B, DLR/TH Wildau. https://elib.dlr.de/130864 (https://elib.dlr.de/130864)
4. Happich C, Janotte N, Pernpeintner J, Schiricke B, Lüpfert E (2018) Second generation linear focus sun simulator to test optical performance of parabolic trough receivers – OptiRec. Solarpaces 2017, AIP conference proceedings 2033, https://doi.org/10.1063/1.5067023 (https://doi.org/10.1063/1.5067023)
5. Hilgert C, Jung C, Wasserfuhr C, Leon J, Valenzuela L (2019) Qualification of silicone based HTF for parabolic trough collector applications. AIP Conference Proceedings 2126:080003. https://doi.org/10.1063/1.5117598 (https://doi.org/10.1063/1.5117598)
CrossRef (https://doi.org/10.1063/1.5117598)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Qualification%20of%20silicone%20based%20HTF%20for%20parabolic%20trough%20collector%20applications&author=C.%20Hilgert&author=C.%20Jung&author=C.%20Wasserfuhr&author=J.%20Leon&author=L.%20Valenzuela&journal=AIP%20Conference%20Proceedings&volume=2126&pages=080003&publication_year=2019&doi=10.1063%2F1.5117598)

6. International Electrotechnical Commission (2020) Solar thermal electric plants www.iec.ch/tc117 (http://www.iec.ch/tc117)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Solar%20thermal%20electric%20plants&publication_year=2020)

7. Janotte N, Luepfert E, Pottler K, Schmitz M (2017) Full parabolic trough qualification from prototype to demonstration loop, Solarpaces 2016. AIP Conference Proceedings 1850:020010. https://doi.org/10.1063/1.4984334 (https://doi.org/10.1063/1.4984334)
CrossRef (https://doi.org/10.1063/1.4984334)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Full%20parabolic%20trough%20qualification%20from%20prototype%20to%20demonstration%20loop%2C%20Solarpaces%202016&author=N.%20Janotte&author=E.%20Luepfert&author=K.%20Pottler&author=M.%20Schmitz&journal=AIP%20Conference%20Proceedings&volume=1850&pages=020010&publication_year=2017&doi=10.1063%2F1.4984334)

8. Lüpfert E, Pottler K, Riffelmann KJ, Ulmer S, Schiricke B, Neumann A (2007) Parabolic trough analysis techniques for optical performance. J Sol En Eng 129. https://doi.org/10.1115/1.2710249 (https://doi.org/10.1115/1.2710249)

9. Lüpfert E, Riffelmann K-J, Price H, Moss T (2008) Experimental analysis of overall thermal properties of parabolic trough receivers. J Sol Energy Eng 130:021007. https://doi.org/10.1115/1.2888756 (https://doi.org/10.1115/1.2888756)
CrossRef (https://doi.org/10.1115/1.2888756)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Experimental%20analysis%20of%20overall%20thermal%20properties%20of%20parabolic%20trough%20receivers&author=E.%20L%C3%BCpfert&author=K-J.%20Riffelmann&author=H.%20Price&author=T.%20Moss&journal=J%20Sol%20Energy%20Eng&volume=130&pages=021007&publication_year=2008&doi=10.1115%2F1.2888756)

10. Marcotte P, Manning K (2014) Development of an advanced large-aperture parabolic trough collector, Energy Procedia 49:145–154. https://doi.org/10.1016/j.egypro.2014.03.016 (https://doi.org/10.1016/j.egypro.2014.03.016)

11. Riffelmann KJ, Schweitzer A, Weinrebe G, Balz M (2019) Planning and building the first ultimate trough collector field in the Kingdom of Saudi Arabia. AIP Conference Proceedings 2126:040002. https://doi.org/10.1063/1.5117582 (https://doi.org/10.1063/1.5117582)
CrossRef (https://doi.org/10.1063/1.5117582)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Planning%20and%20building%20the%20first%20ultimate%20trough%20collector%20field%20in%20the%20Kingdom%20of%20Saudi%20Arabia&author=KJ.%20Riffelmann&author=A.%20Schweitzer&author=G.%20Weinrebe&author=M.%20Balz&journal=AIP%20Conference%20Proceedings&volume=2126&pages=040002&publication_year=2019&doi=10.1063%2F1.5117582)

12. Schmitz M, et al. (2018) Heliotrough collector development. www.heliotrough.com (http://www.heliotrough.com)
Google Scholar (http://scholar.google.com/scholar_lookup?title=Heliotrough%20collector%20development&author=M.%20Schmitz&publication_year=2018)

13. Schweitzer A, Schiel W, Birkle M, Nava P, Riffelmann KJ, Wohlfahrt A, Kuhlmann G (2014) ULTIMATE TROUGH - fabrication, erection and commissioning of the World's largest parabolic trough collector. Energy Procedia 49:1848–1857. https://doi.org/10.1016/j.egypro.2014.03.196 (https://doi.org/10.1016/j.egypro.2014.03.196) CrossRef (https://doi.org/10.1016/j.egypro.2014.03.196) Google Scholar (http://scholar.google.com/scholar_lookup?title=ULTIMATE%20TROUGH%20-%20fabrication%2C%20erection%20and%20commissioning%20of%20the%20World%27s%20largest%20parabolic%20trough%20collector&author=A.%20Schweitzer&author=W.%20Schiel&author=M.%20Birkle&author=P.%20Nava&author=KJ.%20Riffelmann&author=A.%20Wohlfahrt&author=G.%20Kuhlmann&journal=Energy%20Procedia&volume=49&pages=1848-1857&publication_year=2014&doi=10.1016%2Fj.egypro.2014.03.196)

14. UNE (2018) https://www.une.org/encuentra-tu-norma/comites-tecnicos-de-normalizacion/comite/?c=CTN%20206/SC%20117 (https://www.une.org/encuentra-tu-norma/comites-tecnicos-de-normalizacion/comite/?c=CTN%20206/SC%20117)

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https://s3platform.jrc.ec.europa.eu/concentrated-solar-power (https://s3platform.jrc.ec.europa.eu/concentrated-solar-power)
https://setis.ec.europa.eu/solar-thermal-electricity-concentrated-solar-power-implementation (https://setis.ec.europa.eu/solar-thermal-electricity-concentrated-solar-power-implementation)

www.helioscsp.com (http://www.helioscsp.com) and www.protermosolar.com (http://www.protermosolar.com) (news and industry association)

www.nrel.gov/csp (http://www.nrel.gov/csp) (technical info base, publications, projects list)

www.psa.es (http://www.psa.es) (Plataforma Solar de Almería, Spain)

www.rioglass.com (http://www.rioglass.com)

www.solarpaces.org (http://www.solarpaces.org) (International Energy Agency, CSP implementing agreement)

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